Title

Chances of legislators, plant operators and the branch of industry in the inspection of air conditioning systems

Initial Situation

Section §12 EnEV (German Federal Energy Saving Ordinance) for the Energetic Inspection of Air Conditioning systems has been implemented very slowly so far. The research project reveals unused market, investment and energy saving potential, identifies action programmes for the scope of inspection and economic redevelopment obligations. Pragmatic inspection approaches are being formulated and prepared for adoption by national and European standardisation.

The Subject of the Research Project

Based on an analysis of available studies on the non-residential building stock in Germany, two market research surveys have been conducted among approximately 850 potential inspectors. The first survey aimed at establishing the current level of implementation of the inspection obligation. The second was intended to permit statistical statements on the degree of equipment, efficiency and optimisation potential of the plant stock.

After a comparison of the various studies, the evaluation regarding the non-residential building stock permitted to conclude that, in 2012, the stock in Germany comprised approximately 2.400 million m² of utilised space. With a view of the statutory deadlines, the inspections of approximately 170.000 to 290.000 air conditioning units and approximately 20.000 water-based room air condition systems is expected to be completed by October 2013. After having evaluated the market survey it is estimated that the implementation rate is at under 3 %.

The returns from the second survey yielded 119 inspection results for air conditioning systems of a total volume flow of 5 million m³/h (0.1 – 0.15 % of the stock). The statistical evaluation of inspection results permits a differentiated assessment of the stock of plants and the optimisation potential. Particularly high energy-saving potential is seen in the field of process optimisation, which would require little investment.

The evaluation of the overall economy of various typical redevelopment solutions shows that none of the measures are infinitely economic and thus requirements of redevelopment must always be correlated with specific conditions (e.g., plant size, operating time, efficiency of the existing plant). The current requirements of support by the Bafa (German Federal Office of Economics and Export Control) for heat recovery retrofitting of the stock can hardly be met. Merely for existing single-stage plants from 15.000 m³/h on, the retrofit of fans with fan speed control or overall replacement of the air conditioning unit of all variants under review make economic sense.

Moreover, the minimum content and job features of an Energetic Inspection are described in order to define the required scope of works as a prerequisite for verifiability by the legislator. Also the minimum requirements of the qualification of approved experts are defined, whereby their grading in three levels is suggested due to the complexity of air conditioning plants. All contents pertaining to this have been transposed into DIN SPEC 15240.

An evaluation of location-based weather data reveals considerable impact of the site on the share of the utilisable energy demand of air conditioning systems, here in particular on the cooling demand and an almost negligible impact on the chiller’s efficiency ratio. Based on

that, an approximation method has been developed in order to take into account the site impact on the efficiency assessment of the plant stock.

An investigation of various calculation approaches regarding the efficiency assessment shows that load level approaches on a monthly basis for stock assessment are generally suitable and that thereby the real building can precisely be taken into account. Deviations from the hourly approach amount to between 10 and 20 %, but with special uses or types of partial load control also above 30 % in some cases.

A contemplation of available product characteristics of air conditioning systems and chillers shows that precise accordance of product characteristics with parameters established on an hourly basis are impossible despite temperature and weighting adjustment and not urgently necessary either, as correct relation is also at hand without conversion.

A benchmarking approach for user-specific parameters has been described for the cooling load calculation required in the Energetic Inspection. If the defined range of application of this benchmarking approach has practically been exceeded, an approach for estimating the cooling load according to VDI 2078 (2012) can be applied, for which simplifications adapted to the Energetic Inspection have been defined.

Conclusion

The evaluation of the market surveys shows that the available potential is not exploited and a mere 3% maximum of plants subject to inspection has been inspected so far from an energetic point of view. Existing market incentives are partially inappropriate and verification systems do practically not exist. Voluntariness in implementation hampers the exploitation of existing potential.
Standardised approaches, such as DIN SPEC 15240, provide clarity in inspection routines, comparability of offers and quotes and render increasing rates of implementation. Economic and energetic potentials can only be opened up by an increasing level of requirements and by implementation appropriately verified by the legislator.

Key data

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researcher / project management: ILK Dresden (management), schiller engineering, Licht und Luft Consult

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